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THE DIAGNOSIS OF THE SO-CALLED "FUNCTIONAL MURMURS."¹

BY F. C. SHATTUCK, M. D.

IN the second edition of his great work on diseases of the chest, in discussing the cause of cardiac and arterial murmurs, Laennec speaks as follows: "I have known a considerable number of persons die of different diseases, acute or chronic, who had presented this phenomenon (murmur) very distinctly during the latter part of their life, sometimes during several months, as well in the heart as in different arteries, and upon the examination of whose bodies I could discover no organic lesion coinciding constantly with these phenomena, and which are not frequently met with in subjects who had never exhibited anything of the kind during life. In the first edition of this work I considered the bellows-sound of the heart as an indication of the contraction of the orifices. No doubt it exists almost always in this case, but since the first publication of my treatise I have very frequently met with it in individuals who had no lesion of the sort, while on the other hand I have seen ossifications of the valves which were not attended by this sound. . . . In like manner I can state with certainty that the bellows-sound of the heart is very often met with when this organ is perfectly healthy."²

Laennec thus recognized the fact that a murmur is not sufficient evidence on which to base a diagnosis of organic change in the heart or its valves, and, in view of his premature death, it is not to be wondered at

¹ Read before the Suffolk District Medical Society, April 28, 1883.

² Forbes' Translation, page 558. London: Underwood. 1827.

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that he could but very imperfectly practically apply the fact to the clinical distinction between murmurs which are serious and those which are not. "The sole disorder," he says, "which has appeared to me constantly, or almost constantly, to accompany the bellows-sound is a state of nervous agitation more or less marked;"¹ he also noticed that a murmur is produced over an artery when pressure is exerted upon it by the finger or stethoscope, though he failed to see that the pressure is the direct cause of the murmur, but attributes all these murmurs to spasm of the heart or arteries.

Very few of the modern writers on cardiac disease and the physical exploration of the chest with whose works I am acquainted seem to me to be sufficiently explicit in the directions which they give for making this practical distinction, the great importance of which is obvious.

Valvular disease involves more or less disability for life, a disability varying in degree with the character and extent of the disease, the age of the patient, the completeness of the compensation, and last, though, perhaps, not least, the ability and willingness of the patient to avoid over-taxing his heart in any way, and at the same time shun causes of anæmia and debility, which tend to produce relaxation and dilatation of the cardiac walls, and thus impair the compensation.

A person who is so situated that he can live on a level with his heart may perfectly well reach advanced old age, although the valves are somewhat damaged and no life company will insure him. But economy he must practice, having no longer the surplus heart power which belonged to him while the organ was still structurally unimpaired. Moreover, no sooner does a patient learn that there is trouble with his heart than visions of sudden death are only too apt to rise before him. He often sees in the newspapers paragraphs announcing that some one has expired suddenly

¹ Page 560.

in the street, at his place of business, in a public conveyance, and that the "death is attributed to heart disease." In no other class of affections does the sword appear to the eye of the layman suspended by so slender a thread. The profession holds much sounder views as to the compatibility of organic lesions of the valves with longevity than it did formerly, and in time these views will filter down to the general public. But meanwhile it behooves us to be very careful not to be guilty of the disservice of allowing persons with murmurs, but sound hearts nevertheless, to think themselves the subjects of valvular disease.

Dealing with this subject from an exclusively clinical point of view I would include all cardiac murmurs in two grand divisions:—

I. Those dependent on organic and permanent changes, especially in the valves of the heart, commonly called "organic" murmurs.

II. Those not so dependent, and commonly called "functional" or "inorganic" murmurs.

The vexed and very interesting question of the mechanism of this second class of murmurs does not come within the scope of my paper, so I pass on to the conditions under which they occur.

These "functional" or non-serious murmurs are met with

- (1.) In anæmia.
- (2.) In adynamic fevers and chorea.
- (3.) Connected in some way with respiration, the pseudo or respiratory murmurs.
- (4.) Without definite connection of any kind.

(1.) The anæmic murmurs, as their name indicates, are associated with an impoverished condition of the blood from any cause. They are systolic in time, are heard chiefly at the base, and then usually to the left of the sternum in the pulmonic area, though they may also be heard, but with diminished intensity, at the apex. They are apt to be accompanied by venous hum in the veins of the neck, and are said to be louder in the recumbent than in the erect posture.

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(2.) In fevers of any kind attended by severe prostration, and also in chorea, a systolic murmur is often developed about the heart; this murmur is, as a rule, loudest at the apex, and is sometimes heard only at or in the immediate neighborhood of that region.

(3.) The respiratory or pseudo-murmurs may be heard in any portion of the cardiac area, are nearly always systolic in time, and disappear or are greatly modified in character when the breath is held, sometimes at the end of inspiration, sometimes of expiration. Most of them seem to be due to the effect of the cardiac movement on the air contained in thin-walled pulmonary cavities bordering on the heart, or to solidification or retraction of that portion of lung which normally overlies or touches the heart, but they sometimes occur when no change in the pulmonary tissue can be surely detected, at least during life. They are analogous to the subclavian systolic whiff so often heard as well in individuals who are apparently healthy as in those suffering from infiltration of or pleurisy about the apex of the lung.

(4.) One meets with some murmurs at the apex, as well as at the base, unassociated with anæmia, chorea, fever, accentuation of the pulmonic second sound, phases of the respiratory process, changes in the lungs, or any previous history of rheumatism, which, from the practical point of view of prognosis and treatment, I class as functional, for the reason that months after they were first observed they remain the sole evidence of any inadequacy of the heart for its work.

For this classification I do not claim absolute completeness, but think that it will be found to include all the non-serious cardiac murmurs which are not extremely rare.

We now come to the clinical distinction between these murmurs and those which are serious, organic, incurable, and involve disability.

This distinction involves their consideration.

(a.) As to rhythm.

(b.) As to associated conditions.

(c.) As to persistency.

(d.) As to time of propagation.

(e.) As to enlargement of the heart.

(a.) Functional murmurs are almost always systolic in time. Some authorities allow no qualification, but later writers are more cautious, and rightly so in view of the three cases, with autopsies, reported by Weiss,¹ who also alludes to a few observed by others. A practical deduction is that diastolic murmurs are almost always organic.

(b.) The association of anæmia, adynamic fever, chorea, and phases of the respiratory process or lung changes require merely mention.

(c.) The murmurs belonging to the above conditions are not persistent, except occasionally that of chorea. In anæmia and fever the murmurs disappear with the restoration of the general health, and the pseudo-murmurs are characterized by their dependence on respiration or changes in the lungs. Organic murmurs may, it is true, disappear for a time from feebleness in the power of the cardiac contraction, or other cause; but their sequence, enlargement of the heart, does not disappear with them.

(d.) Functional murmurs have no definite line of propagation, the basic into the carotids, as in aortic obstruction; the apical toward the axilla or round to the back, as in mitral regurgitation. They are pretty closely limited to the cardiac area, and are very rarely, if ever, to be heard at the lower angle of the scapula. It must, however, be confessed that the mere loudness of a murmur is no safe index of its gravity.

(e.) We now come to the point of all others the most important, that, namely, of enlargement of the heart. Whenever obstruction or regurgitation at an orifice is in the least marked or has lasted a little time the normal balance of the circulation is disturbed and can be restored only in one way, by an increase in the size

¹ Wiener Wochenschrift, 1880, pages 137 and 160.

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and power of the heart, such increase predominating in that portion of the organ on which the bulk of the extra work is thrown. This is what is meant by compensation. Thus, in aortic disease, the extra work being primarily thrown on the left ventricle this must increase in size and power to compensate the lesion; in mitral disease the heightened resistance in the pulmonary circuit involves like changes in the right ventricle. If compensation is not established the heart must soon fail; if it is established the sole means is through enlargement, in which hypertrophy predominates over dilatation, and this enlargement must, generally speaking, be directly proportional to the extent of the lesion. Thus in either case we are not left long in doubt. Here, it seems to me, lies the kernel of the whole question. Whether regurgitation through the mitral orifice is the true cause of the murmurs of anæmia and the adynamic fevers as well as of any and every systolic souffle at the apex of the heart; whether this regurgitation be due to relaxation of the heart alone, as is maintained by McAlister,¹ or to relaxation and a slight degree of enlargement, as is maintained by Balfour,² are questions of no material importance from a purely clinical stand-point, though of course from the points of view of physiology and pathology they are highly important and most interesting.

As regards prognosis and treatment a murmur, even if persistent, is of no importance to the patient unless it either is or, after a reasonable time, say six months if you choose, becomes associated with other well-marked evidences of a disturbance of the balance of the circulation, above all enlargement of the heart in some or all of its divisions.

But it is necessary to say one word more on this matter of enlargement. There seems to be little or no room for doubt that in anæmia and fevers of some severity or duration a certain relaxation of the cardiac muscle

¹ British Medical Journal, 1882, ii. 821.

² Diseases of the Heart, second edition.

results from the impaired nutrition, and that in consequence of this the heart becomes somewhat dilated and therefore enlarged. It is, however, my belief that this enlargement is rarely sufficient to be manifested by physical signs indicating that condition. In anæmia the second pulmonic sound is apt to be accentuated, but the very existence of the anæmia will prevent us from attaching too much importance to that fact, which, in the absence of such a condition, and provided always that the accentuation is real and not simply apparent, the aortic second being weakened or the lung tissue about the pulmonary artery being condensed or retracted, should always put us on our guard as to the presence of mischief.

It should be added, in passing, that a person, notably a young girl with menstrual irregularity, may be anæmic although the cheeks are flushed and the lips of a deep red. The pale, large, and indented tongue and the clammy hands and feet tell the true story.

Balfour finds the murmur of anæmia as a rule loudest an inch and a half to the left of the sternal border in the second interspace, over the seat of the left auricle. Since I became acquainted with his writings I have examined many cases with reference to this point, and my experience coincides with the almost universal teaching that the point of maximum intensity is usually just to the left of the sternum in the second interspace or over the third left costal cartilage.

To sum up. The true cause of cardiac murmurs, especially those ordinarily called "functional," not being fully understood, for practical purposes we need a practical classification. Clinically, then, we may divide murmurs broadly into the serious and non-serious, terms which do not especially please me, and which I am ready to abandon at any moment for others more descriptive and equally concise. Even if we include in the latter group some murmurs which are truly organic it seems to me that we do no harm, inasmuch as an injury to a valve which is so slight as to be fol-

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lowed by no other evidence of disturbance of the circulation after the lapse of six months or a year cannot be of any consequence.

The differential diagnosis may be tabulated thus :—

THE SERIOUS MURMURS	THE NON-SERIOUS MURMURS
Occur at any time in the cardiac revolution.	Are systolic in time.
Are apt to be associated with rheumatism or its history, or with degenerative changes in other parts or organs.	Are usually associated with anæmia, fevers, chorea, or respiration.
Have definite lines of propagation.	Have no definite lines of propagation.
Are persistent.	Are usually transitory.
Involve well-marked enlargement of the heart.	Involve no marked enlargement of the heart.